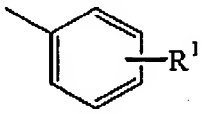
REMARKS

Claim 1 has been amended to recite that the two R^1's in formula [4] are the same and to include the proviso that R is different from



These amendments are supported by the description on page 1, paragraph [0024] in the publication of the present application, U.S. Publication No. US2007/0083060 (hereinafter referred to as "the present US Publication"). Paragraph [0024] describes that the invention of the present application is a method for producing a triarysulfonium salt having a structure that only one of the three aromatic rings on the cation portion thereof is different from the other two aromatic rings.

Also, the recitation in claim 1 that "an activator with high affinity for oxygen of 3 to 7.5 equivalents" has been amended to -- an activator with high affinity for oxygen of 4.5 to 7.5 equivalents --. This amendment is supported by claim 9 and the description on page 11, paragraph [0070] in the present US publication. Claim 9 has been canceled.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oono et al., U.S. Patent No. 6,723,483 ("Oono") in view of Osawa et al., U.S. Patent No. 5,824,824 ("Osawa").

Applicants respectfully submit that the combination of Oono and Osawa is insufficient to support a case of prima facie obviousness of the claims of the present application under 35 U.S.C. § 103(a) and, notwithstanding such insufficiency, the comparative data in the application demonstrate unexpected results sufficient to rebut any prima facie obviousness alleged by the Office to be supported by the prior art. The differences between the method of the present invention and the methods disclosed in the cited references and suggested by the Office's combination of the references are explained below.

The present invention, as precisely recited in the amended claims, relates to a method for producing a triarylsulfonium salt having a structure that only one of the three aromatic rings on the cation portion is different from the other two aromatic rings (see paragraph [0024] in the present US publication). In the method of the present invention, an activator with high affinity for oxygen is used in an amount of 4.5 to 7.5 equivalents relative to the diaryl sulfoxide reactant.

In the method of the present invention for producing a triarylsulfonium salt [4] a diaryl sulfoxide [1] and an aryl Grignard reagent [2] are reacted in the presence of an activator with high affinity for oxygen (hereinafter, abbreviated as "the activator") in an amount of 4.5 to 7.5 equivalents relative to the the diaryl sulfoxide, and then the resultant reaction mixture is reacted with a strong acid [3], or a salt thereof.

The structure of the aromatic ring of the aryl Grignard reagent used in the method of the present invention is different from those of the two aromatic rings of the diaryl sulfoxide. In particular, the present invention relates to a method for producing a triarylsulfonium salt whose cation moeity has only one aromatic ring different from the other two aromatic rings (see paragraph [0024] in the US Publication).

The method of the present invention shows unexpected excellent effects with the use a larger amount of the activator than has been conventionally used. In particular, the use of 4.5 to 7.5 eq. of the activator can obtain a desired sulfonium salt efficiently in a high purity without byproducts (see paragraphs [0033] and [0070] in the US publication).

More specifically, the method of the present invention has been made to solve such a problem that when a diaryl sulfoxide [two

aromatic rings have the same structure (structure [a])] and an aryl Grignard reagent having an aromatic ring different from the aromatic ring of the diarylsulfoxide (structure [b]) are reacted not only the desired compound (wherein two aromatic rings are structure [a] and one aromatic ring is structure [b]) is obtained, but also two kinds of byproduct (one sulfonium salt, wherein three aromatic rings are all structure [a], and/or another sulfonium salt, wherein one aromatic ring is structure [a] and two aromatic rings are structure [b]) are obtained. The present invention has been completed on the basis of the present inventors' finding that use of the activator of 4.5 to 7.5 eq. relative to the diaryl sulfoxide can obtain the desired sulfonium salt effectively in a high yield without any such byproducts (see paragraph [0007] in the US Publication).

This is clear from the description in paragraph [0070] of the present US Publication [0070]: "the lower limit thereof (of an amount of use of the activator) is preferably in the order of 3, 4 and 4.5 eq. and the upper limit thereof (of an amount of use of the activator) is preferably in the order of 7.5, 7 and 6 eq., relative to an amount of the diaryl sulfoxide".

Further, it has been demonstrated by the data in examples of the present application that the activator of the present invention

shows an unexpectedly excellent effect by using the activator of 4.5 to 7.5 eq. In particular, on page 15, Table 7, in the present US publication there is a description of yields of the obtained objective compound and those of byproducts obtained when using chlorotrimethylsilane (TMSCl) as the activator in amounts of 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 7.5 eq., relative to the diphenyl sulfoxide.

As is clear from the results of Table 7, it can be understood that use of TMSCl as the activator in an amount of 2.5 eq. relative to the diphenyl sulfoxide forms not only byproducts but also a low yield of the objective compound (59%) (see Comparative example 1). Further, as is obvious from the results of Experimental Examples 1 and 2, it can be understood that use of TMSCl (activator) in an amount of 3 and 4 eq. can produce the objective compound with a certain amount of yield (72%), but still forms byproduct.

In contrast, as is obvious from the results of Experimental Examples 3 to 6, use of TMSCl (activator) in an amount of 5, 6 and 7.5 eq. relative to the diphenyl sulfoxide does not result in the formation of byproducts at all and produces the objective compound with a high yield.

As is described above, use of the activator of the present invention in an amount of 4.5 to 7.5 eq., relative to the diphenyl

sulfoxide, shows unexpected excellent effects as described above when producing a triarylsulfonium salt having only one aromatic ring different from the other two aromatic rings on the cation portion thereof.

Disclosure of Oono

Oono discloses a method for producing a triarylsulfonium salt by reacting diaryl sulfoxide, trimethylsilylsulfonate (an activator) and an aryl Grignard reagent (see Oono , column 11, lines 45-48).

However, the method of Oono for producing a sulfonium salt, also produses a salt whose cation portion has three identical aromatic rings. In contrast, as previously explained, the present invention is limited to a method for producing a sulfonium salt, whose cation portion has only one aromatic ring different from the other two aromatic rings. Therefore, Oono differs from the present invention in this point.

Further, an amount of activator to be used in Oono is 0.8 to 2 mol relative to 1 mole of the diarylsulfoxide (0.8 to 2 eq. relative to the diaryl sulfoxide), which is different from that of the activator of the present invention (4.5 to 7.5 eq. relative to the diarylsulfoxide), and forms byproducts.

In the Examples of Oono, there is a disclosure of a method for producing a sulfonium salt, where the cation portion has two identical aromatic rings (structure [a]) and one aromatic ring (structure [b]) different from the other two (structure [a]), using a trimethylsilyl sulfonate such as trimethylsilyl triflate in an amount of 0.13 mol relative to diphenyl sulfoxide of 0.1 mol (i.e., an amount of the activator of 1.3 eq. relative to the diphenyl sulfoxide). However, the yield of the sulfonium salt is low (43%).

Further, as it is clear from the data in the present application, the method in the example of Oono forms byproducts other than the desired compound although there is no disclosure in Oono whether byproducts are formed or not. In particular, there is neither a disclosure, nor a suggestion of what to do in order to control the formation of byproducts (see Oono, Examples 1-14).

Disclosure of Osawa

Osawa discloses a method for producing a triarylsulfonium salt by reacting a diaryl sulfoxide and an aryl Grignard reagent in the presence of trimethylsilyl chloride (activator) of 1 to 5 mole, preferably 2 to 3 mole, relative to the diaryl sulfoxide (see column 11, line 32, to column 12, line 4).

However, the sulfonium salt obtained by Osawa's method includes a sulfonium salt having three identical aromatic rings of

the cation portion. In contrast, as has been explained previously, the sulfonium salt obtained by the method of the present invention is limited to a sulfonium salt having one aromatic ring different from the others of the three aromatic rings of the cation portion. Therefore, Osawa also differs from the present invention in this point.

This is clear from concrete description of Osawa's Examples, synthesizing both a sulfonium salt having the same three aromatic rings and a sulfonium salt having only one aromatic ring different from the other two.

Further, in Osawa, there is a disclosure of concrete examples of synthesis of a sulfonium salt having two identical aromatic rings (structure [a]) and one aromatic ring different from the other two (structure [b]). However, there is no disclosure relating to the formation of byproducts. In other words, there is neither a disclosure nor a suggestion of what steps to take in order to control the formation of both a byproduct having three identical aromatic rings (structure [a]) and a byproduct having one aromatic ring (structure [a]) and two aromatic rings (structure [b]) of the three aromatic rings (see Osawa, synthesis examples 2 and 4).

Osawa discloses an amount of use of trimethylsilyl chloride (TMSCl) as the activator of 1 to 5 eq., preferably 2 to 3 eq. relative to the diaryl sulfoxide. That is, it is preferable to use TMSCl in an amount of 2 to 3 eq. (see Osawa, column 12, lines 1-2).

As is clear from the following Table 1, Osawa's examples specifically disclose the use of TMSCl of 2.5 or 3 eq., relative to the diaryl sulfoxide (see column 17, synthetic example 1; column 18, synthetic example 2; and column 20, synthetic example 4).

[Table 1]

	Diarylsulfoxide (mol)	TMSCl (mol)	Amount of use of TMSCl (/diarylsulfoxide)
Synthetic Example 1	0.052	0.13	2.5 eq.
Synthetic Example 2	0.10	0.30	3 eq.
Synthetic Example 3	0.10	0.30	3 eq.

As is clear from the above, though Osawa broadly discloses an amount of use of TMSCl as the activator of 1 to 5 eq. relative to the diaryl sulfoxide, the amount of TMSCl actually used in the examples is 2.5 to 3 eq. Osawa also describes that it is preferable that an amount of use of the activator is selected from the range of from 2 to 3 eq., and therefore, it is natural for the skilled artisan to predict that the results of use of the activator in an amount of 5 eq. relative to the diaryl sulfoxide will not be better than the results of the use of the activator in an amount of 2.5 to 3 eq. As is clear from the data disclosed in the present

invention, it can be understood that use of TMSCl in a range of 2.5 to 3 eq. forms byproduct.

Moreover, in Osawa, there is no disclosure of what to do in order to control formation of byproducts. There is neither a disclosure, nor a suggestion of reducing byproducts as in the present invention and there is no disclosure or suggestion of a concrete method to reduce byproducts.

Therefore, the characteristic feature of the present invention and the excellent effects obtained by this feature, that is, the use of an activator such as TMSCl of 4.5 to 7.5 eq. relative to the diaryl sulfoxide, to obtain the desired compound with high purity and without byproducts, cannot be reasonably predicted based on the description of Osawa.

Combination of Oono and Osawa

As described above, what one skilled in the art can expect easily on the basis of the combination of Oono and Osawa is only a "a method for producing a sulfonium salt by reacting a diaryl sulfoxide and an aryl Grignard reagent in the presence of trimethylsilyl sulfonate (activator) of 0.8 to 3 eq. relative to the diaryl sulfoxide, and the sulfonium salt obtained by said method includes both one having three same aromatic rings and one having only one aromatic ring different from the other two".

However, as is clear from the results of Comparative Example 1 in Table 7 of the present application, it can be understood that use of an activator (TMSCl) of 2.5 eq. not only forms byproducts but also obtains an objective compound in low yield (59%).

Further, as is clear from the results of Experimental Examples 1 to 2 in Table 7 of the present US publication, use of the activator of the present invention in an amount of 3 or 4 eq. is the same as or worse than that of trimethylsilyl sulfonate of 2.5, 3 or 4 eq.

In contrast, as is clear from the results of Experimental Examples 3 to 6, use of the activator of the present invention in an amount of 5, 6, 7 or 7.5 eq. shows unexpected excellent effects such as a high yield of the objective compound without formation of byproducts.

Such excellent effects cannot be reasonably predicted from the combination of Oono and Osawa.

For the above reasons, removal of the 35 U.S.C. 103(a) rejection of the claims is believed to be in order and is respectfully requested.

The foregoing is believed to be a complete and proper response to the Office Action dated December 4, 2007, and is believed to overcome the rejection in the Action and to place the application

in condition for allowance. Removal of the rejection and a notice of allowability are believed to be in order and are respectfully solicited.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension and any additional fees that are required may be charged to Deposit Account No. 111833.

Respectfully submitted,
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